Type: Article in Edited Collection

Author: Queiroz, Joao *et al*

Title: The Biosemiotic Approach in Biology: Theoretical Bases and Applied Models

Year: 2011

Editor: Terzis, George &amp Arp, Robert

Volume Title: Information And Living Systems: Philosophical and Scientific Perspectives

Place: Cambridge, Massachusetts

Publisher: MIT Press

Pages: 91-130

Abstract: Biosemiotics is a growing field that investigates semiotic processes in the living realm, addressing meaning, signification, communication, and habit formation in living systems, and the physicochemical conditions for sign action and interpretation. Scientific fields such as molecular biology, cognitive ethology, cognitive science, robotics, and neurobiology deal with information processes at various levels and, thus, provide knowledge about biosemiosis (sign action in living systems). Biosemiotics attempts to integrate these findings, so as to build a semiotic foundation for biology. In the development of biosemiotics as a research field, it is particularly important to build specific models of life processes, emphasizing their signifying nature, and, thus, helping to enrich and complement the biological sciences as standardly understood. Accordingly, we show in this paper how one can draw on a particular semiotic theory, namely Peirce's theory of signs, to construct such models. We discuss two semiotic models here, one of the cell's genetic sign system, the other of signal transduction in B-cell activation. At present, we do not have an established general notion of biological information (despite the roles that the mathematical theory of communication can play in biological research). It is a basic contention of this work that biosemiotics can help in building a semantic/pragmatic concept of biological information. We intend to advance a theoretical basis for a biosemiotic approach to living systems, and, thus, shed light on the notion of information as employed in the biological sciences. We also intend to show that semiotic modeling is a necessary counterpart to functional and mechanistic models of genetic and signaling systems. This framework for a theory of biological information is consistent with the general picture of genetic information and signaling processes in genetics and

molecular biology, with the fundamental difference that, first, a concept of information is explicitly formulated within a heuristically powerful theoretical structure, and, second, information is on these grounds conceptualized as a process. The conceptual tools offered by Peircean semiotics can deepen our understanding of biological phenomena that are described by a communicational and informational vocabulary. This is particularly important in a time in which biology is increasingly seen as a science of information.

Language: English

Links: Information and Living Systems

Keywords: Biological Information, Gene, Signaling, Meaning, Biosemiotics